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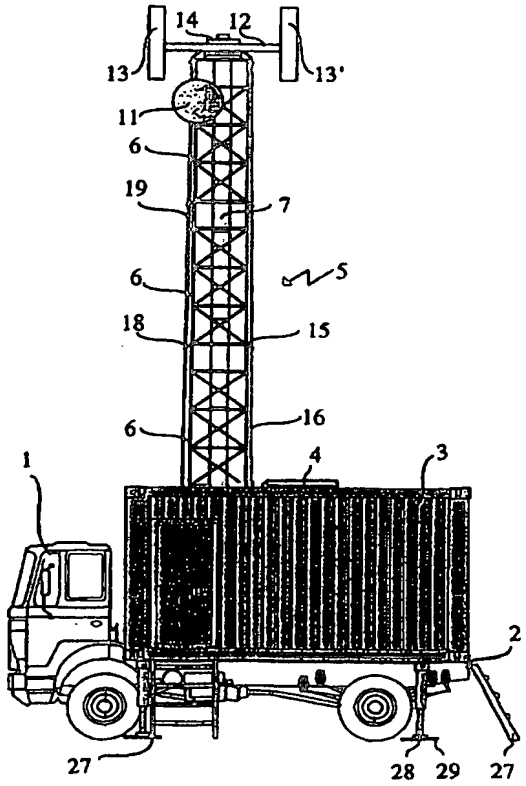
(54) Title: TELECOMMUNICATION MOBILE STATION

(57) Abstract

A telecommunication mobile station comprising a plurality of equipments (17) for transmitting and receiving radio signals, which are housed inside a control centre (3) mounted on means of transportation (1) and comprising a retractable tower (5) for at least one radio antenna (11, 13, 13') connectable to said equipments (17). Such a telecommunication station may be quickly transported and operated in the place of use.



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"TELECOMMUNICATION MOBILE STATION"

DESCRIPTION

The present invention relates to a telecommunication mobile station, and particularly to a mobile station which may be quickly transported and operated in the place of use.

It is known that, in order to create a telecommunication network, e.g. a mobile telephone network, it is necessary to install on the territory a set of stations mutually connected through antennas mounted on a suitable tower raised near each station. Such stations comprise a set of electric and electronic equipments for receiving and transmitting the radio signals of the antennas, as well as other equipments for performing the services the station is installed for, such as e.g. the equipments for the telephonic switching. In specific regions and for specific periods, particularly during emergency situations, it is necessary to quickly install a telecommunication station suitably covering a region otherwise being uncovered or having a limited coverage. Such a problem is solved by transporting with a semi-trailer a known tower for radio antennas to the place of use. By means of the same semi-trailer or another motor vehicle, all the equipments and the infrastructures for installing the station are also transported to the place of use. By external means, such as e.g. a crane, the station is built and the tower is raised, having finally the antennas mounted thereon.

Both the transport of the materials required for building the telecommunication station and the raising of the tower for the antennas, obviously require a great waste of means and time, besides that some regions cannot be reached by the semi-trailer and/or by the cranes. Once its service is performed, the emergency station must be dismantled to be transportable elsewhere or to be stored. In order to do so, it is obviously necessary to carry out backwards all the aforementioned complex operations, which results in

doubling the high costs and working times.

It is thus an object of the present invention to provide a telecommunication station free from such drawbacks, i.e. a station which may be transported, installed in the place of use and finally removed therefrom in a simple, quick and safe way. Such an object is achieved by a telecommunication mobile station having the characteristics disclosed in claim 1.

Such a station is provided with all the means necessary for its working, including the antenna tower which is suitably retractile and nevertheless so solid to be mountable and transportable on the platform of a small-sized truck. The telecommunication mobile station according to the present invention is thus capable of reaching even inaccessible regions and of providing in such regions all the services of a fixed station.

Thanks to height and the solidity of the extended tower, it is possible to easily mount thereon many different antennas, so as to cover, for instance, the wide range of mobile telephone network standards.

Furthermore, thanks to the legs provided at the base of the control centre of the mobile station according to the present invention, it is possible to steadily install said centre on the ground and then move elsewhere the means of transportation used for carrying the station to the place of use.

Further advantages and characteristics of the telecommunication mobile station according to the present invention will be evident to those skilled in the art by the following detailed description of an embodiment thereof with reference to the attached drawings, wherein:

- Fig. 1 shows a side view of the telecommunication station according to the present invention; and
- Fig. 2 shows a diagrammatic top plan view of the inside of the control centre of the station in Fig. 1.

Referring to Fig. 1, the telecommunication station according to the present invention comprise a truck 1 of a known type, preferably being small-

sized and having mechanics suitable for the movement on unsettled roads, even off-road. In the present embodiment such a truck is provided with two axles and four driving wheels, and is driven by a Diesel engine with at least a 250 HP (184 kW) power. The platform 2 of truck 1 has fastened thereon, preferably in a removable way, a control centre 3, in its simplest form formed of a metal container provided with a plurality of openings on its sides and its top, as hereinafter described. In the present embodiment such a container is 2,65 meters high, 2,5 meters wide and 5,5 meters long, but these dimensions obviously vary depending upon the devices to be housed therein. Platform 2 is spaced about 1,3 meters from the ground, whereby the total height of truck 1 provided with control centre 3 is smaller than the maximum limit of 4 meters, to be complied with in order to circulate in the streets without problems of overall height occurring.

In the top of control centre 3 a rectangular opening is provided which may be shut by means of a trapdoor 4. A tower 5, mounted onto the base of centre 3, comes out through such opening. In the present embodiment, such a tower is 8,1 meters high from the base of control centre 3, i.e. 9,4 meters from the ground, and fills a area enclosed in a square of 0,8 meters per side. Tower 5 is suitably divided in a plurality of members 6, which in the represented example are four, but may be more when a higher tower is required, up to total heights of about 30 meters. Fig. 1 shows only three of such members 6, since the fourth member, being fastened to the base of control centre 3, lies inside such a centre. In their simplest form members 6 are formed of trestles having the shape of a right-angled parallelepiped. Each trestle comprises a reticular structure comprising metal sections, preferably made of FE370-type steel, soldered to one another. Their height is approximately the same and is equal to about 2,3 meters, whereas their cross-sections are suitably differentiated such that members 6 may be arranged inside one another when tower 5 is in a retracted position inside control centre 3. When the tower is in a extended

position, as shown in Fig. 1, coaxial members 6 are arranged upon one another. In such a position the lower end of the member 6 lying on top is fastened to the upper end of the underlying member, having its lower end in turn fastened to the upper end of the underlying member, and so on. Members 6 are fastened to one another preferably by means of bolts and therefore each of the four angle sections forming the longitudinal structure of each member 6 has at its ends four holes arranged at symmetrically opposite positions. A plurality of plates (not shown in the figure) are inserted in the space which is left between each pair of members 6 for a smooth sliding of a member inside the other. Thanks to such plates, it is possible to perfectly align the axis of members 6 during the mounting of tower 5.

Also referring to Fig. 2, tower 5, in order to be raised, is provided with a lifting device arranged therein in the middle. In the preferred embodiment, such a device is formed of an oleodynamic lifter comprising a plurality of coaxial pistons 7, the outermost of which is inserted into a cylinder 8 fastened onto the base of control centre 3. The upper end of the innermost piston 7 is instead fastened, preferably in a removable way, to the upper end of upper member 6 of tower 5. In order to extend the oleodynamic lifter, cylinder 8 is connected to a pump 9, suitable for pumping into such a cylinder the fluid contained in a tank 10. Tower 5 may have fastened on its top a parabolic antenna 11 and a transversal bar 12, possibly having in turn mounted at its ends a pair of vertical antennas 13, 13'. In the present embodiment, transversal bar 12 is fastened to the upper end of member 6 lying on top by means of an orienting device 14, which is mounted onto bearings and may be rotated for 360° around its axis preferably through an electric servocontrol. Thanks to this arrangement, antennas 13, 13' may be oriented from the ground in the optimal direction for receiving and/or transmitting the radio signal , without having to climb tower 5.

A whipping 15, formed of a curved rod, is hinged to the upper edge of each coaxial member 6. The set of such whippings 15 acts so as to keep close

to tower 5 cables 16 connecting antennas 11, 13, 13', which are located on top of the tower, to the relevant electric and electronic equipments 17 for processing the radio signals, which are housed inside control centre 3. A whipping 18, likewise formed of a curved rod, is likewise hinged to the upper edge of each coaxial member. The set of such whippings 18 acts so as to keep close to tower 5 supply cable 19 connecting the orienting device 14 to a generator 20 of a known type, which is driven by a Diesel motor and has a cylinder capacity sufficient to electrically supply also all the devices of control centre 3 with at least a 13 W power. Such a generator is suitably acoustically and thermally insulated both with respect to the inside of control centre 3 and the outside, obviously except for the engine exhausts. Two cable-winders 21, 21' are arranged on the base of control centre 3 in order to keep cables 16 and 19 taut and close when tower 5 is in an extended position, and to rewind them when it is retracted. Equipments 17 are separated from tower 5 and from generator 20 by means of a metal bulkhead 22 dividing control centre 3 in an engine-room 23 and in a control-room 24 suitable for housing also one or more operators. Engine-room 23 is accessible from the outside through two doors 25, 25', provided on each side wall of control centre 3, whereas control-room 24 is accessible from the outside through a door 26 provided on the back of control centre 3. Three step-ladders 27 are suitably hinged under doors 25, 25', and 26, allowing to enter control centre 3 from the ground and being foldable under the base of said centre. Also means for the rest on the ground are fastened to the base of control centre 3, being in the present embodiment formed of four retractile legs 28 which comprise oleodynamic pistons having mounted at their ends resting plates 29.

After being driven as far as the place of use, the telecommunication mobile station according to the present invention is steadily installed on the ground by means of legs 28. By differently lifting the oleodynamic pistons of such legs, it is possible to make up for possible unevenness of the ground and

to arrange control centre 3 perfectly level. In order to accomplish such a compensation, it is suitable, however not strictly necessary, to unfasten control centre 3 from platform 2 of truck 1. Thus truck 1 may also temporarily move away from control centre 3, e.g. for transporting other materials. Control centre 3, being completely self-sufficient ant steadily located in the place of use, is now arranged for its function by taking step-ladders 27 out, opening trapdoor 4 and mounting bar 12 with antennas 13, 13' on the upper end of innermost member 6 of tower 5. Tower 5 is then raised by operating oleodynamic lifter pump 9, being electrically supplied by generator 20. Pistons 7 are accordingly urged upwards by the pressure exerted by the fluid of tank 10, being pumped into cylinder 8. As soon as upper member 6 almost totally protrudes with respect to the other members, pump 9 is stopped and such a member is bolted to the underlying one. At this point equipments for telecommunication, such as e.g. parabolic antenna 11, may be mounted also on the side walls of member 6. Subsequently, and until tower 5 is completely raised, pump 9 is restarted, while from time to time stopping it in order to allow a member 6 to be bolted to the underlying one. Once antennas 13, 13' are exactly oriented by means of orienting device 14, the telecommunication station according to the present invention is ready for the use.

Once having performed its service, the telecommunication station according to the present invention may be uninstalled by carrying out backwards the aforementioned working steps, whereafter it is ready to be transported elsewhere, where its services are required. It should be noted that it is never necessary to climb tower 5 in a totally extended position in order to carry out all the operations for installing and uninstalling the telecommunication station according to the present invention.

Control centre 3 of the telecommunication station according to the present invention is likewise provided with a set of auxiliary equipments (not shown in Figure), such as e.g. a lighting installation, an alarm system, an air-

conditioning system, etc., being useful for its proper working. Furthermore the station according to the present invention, although being completely self-sufficient, may obviously be nevertheless provided with means for the connection to external cables of electric supply or signal transmission, being already installed in the place of use.

Further modifications and/or additions may be made by those skilled in the art to the herein described and illustrated embodiment, without departing from the scope of the invention.

CLAIMS

1. A telecommunication mobile station comprising a plurality of equipments (17) for transmitting and receiving radio signals, which are housed inside a control centre (3) mounted on means of transportation (1), characterized in that the control centre (3) comprises a retractable tower (5) for at least one radio antenna (11, 13, 13') connectable to said equipments (17).

2. A station according to one of the previous claims, characterized in that the tower (5) is divided into a plurality of coaxial members (6) telescopically extendible by means of a lifting device, the upper end of the innermost member (6) being provided with fastening means (12) for said antenna.

3. A station according to the previous claim, characterized in that at least one coaxial member (6) is a trestle.

4. A station according to the previous claim, characterized in that said trestle comprises a reticular structure having the shape of a right-angled parallelepiped.

5. A station according to one of the previous claims, characterized in that each coaxial member (6) comprises at least one whipping (15,18) hinged to the upper edge of member itself.

6. A station according one of the previous claim, characterized in that the lifting device comprises an oleodynamic lifter (7, 8) arranged inside the tower (5).

7. A station according to one of the previous claims, characterized in that the control centre (3) is provided with a plurality of legs (28) liftable by means of oleodynamic pistons.

8. A station according one of the previous claims, characterized in that the control centre (3) comprises a generator (20) suitable for feeding the devices contained in the control centre (3).

9. A station according to one of the previous claims, characterized in that the fastening means (12) for the radio antenna (13, 13') on top of the tower may be rotated for 360° around their axis by means of an orienting device (14) comprising an electric servocontrol operable from the control centre (3).

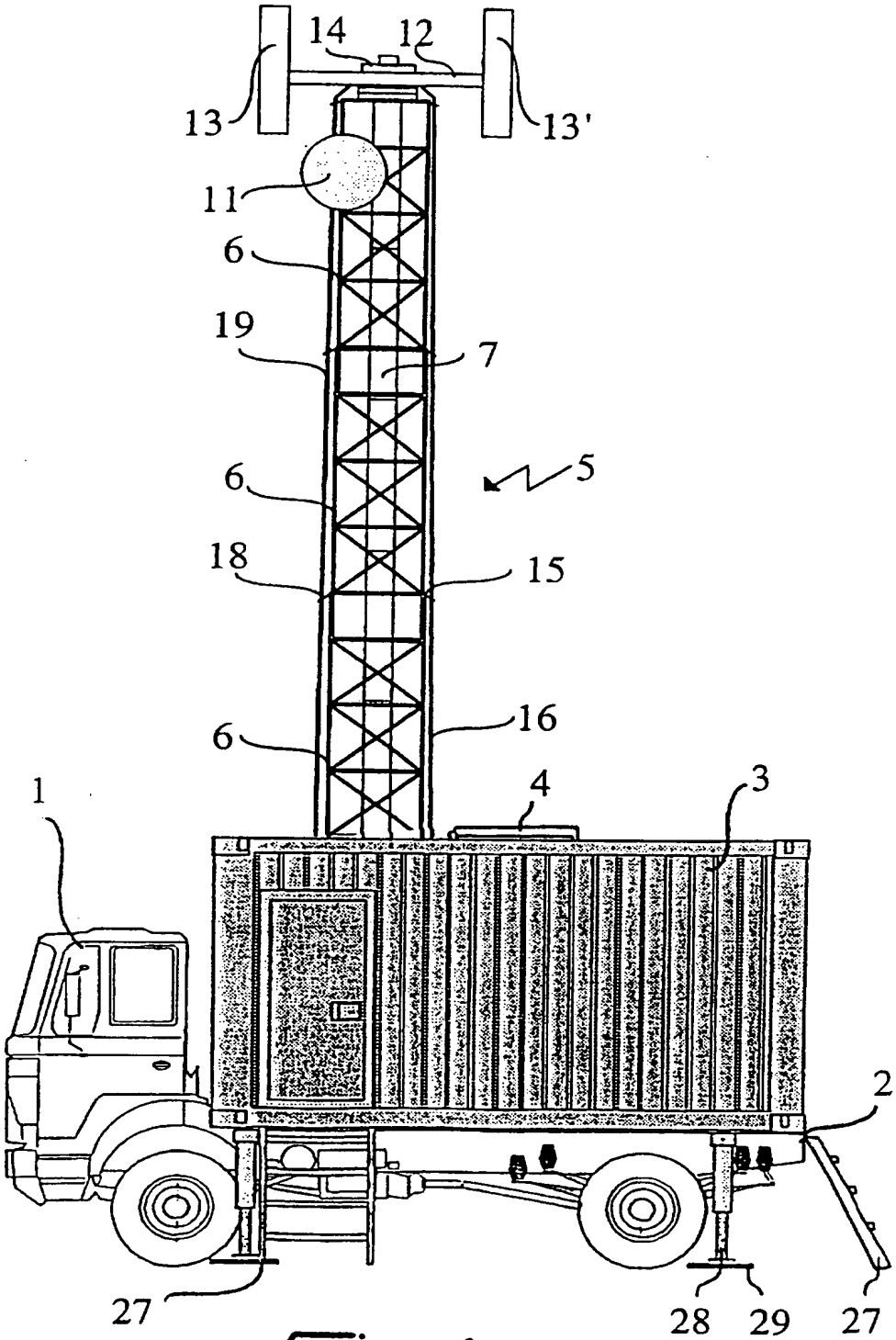

Fig.1

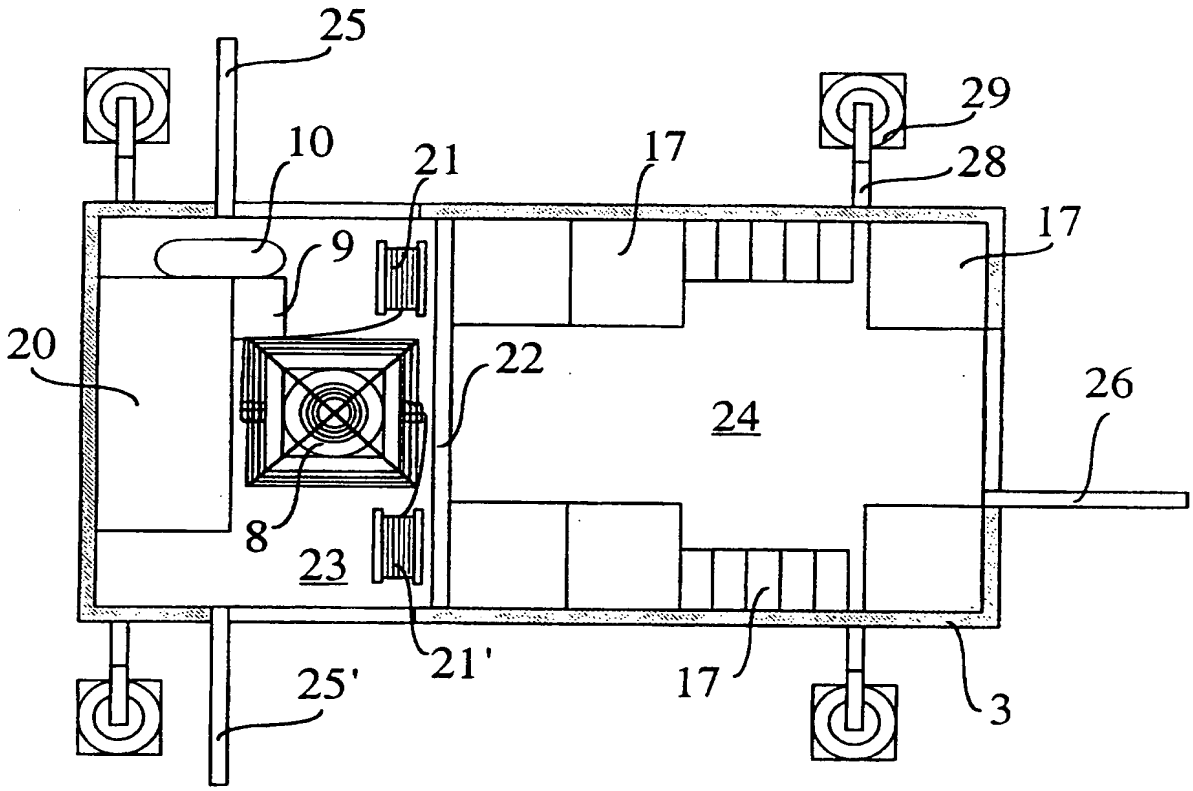

Fig.2

INTERNATIONAL SEARCH REPORT

Inten nal Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H01Q1/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H01Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 27146 A (TRI EX TOWER CORP ;MARUE EDWARD A (US); PEREIRA KENNETH J (US)) 12 October 1995	1,2,5,6
Y	see page 1, line 1 - page 1, line 25 see page 5, line 8 - page 5, line 13 see page 6, line 24 - page 9, line 16 see claims 3,4	3,4,7-9

Y	US 5 414 435 A (WOLF JAMES S) 9 May 1995 see column 1, line 1 - column 1, line 60	9

Y	US 1 426 276 A (CHRISTIE, HANS L. ET AL.) 15 August 1922 see the whole document	3,4,7,8

A	US 4 912 893 A (MILLER HARMON R ET AL) 3 April 1990	

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5 537 125 A (HARRELL JR ROY L ET AL) 16 July 1996 ---	
A	US 5 168 679 A (FEATHERSTONE HARRY E) 8 December 1992 -----	

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Information on patent family members

Inten .nal Application No
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